

1.8 - Exploring Translations of a Quadratic Relations

1. factored form: $y = a(x - s)(x - t)$

2. standard form: $y = ax^2 + bx + c$

3. vertex form: $y = a(x - h)^2 + k$

a tells us the **direction of opening** (up or down),
and any **vertical scaling** (stretch or compression)

h is the **x-coordinate** of the vertex.

k is the **y-coordinate** of the vertex.

The vertex of the parent function, $\star y = x^2$, is (0, 0).

If the vertex has moved from (0, 0) to (h, k) then the graph has been

translated \star **vertically by k units** (up or down)

and \star **horizontally by h units** (left or right)

Vertex Form: $y = a(x - h)^2 + k$

What about the signs of h and k?

Ex.2 State the coordinates of the vertex and direction of opening.

(a) $y = (x - 5)^2 + 4$ Vertex (5, 4) Opens up

(b) $y = (x + 3)^2 + 11$ Vertex (-3, 11) Opens up

(c) $y = -2(x - 6)^2 - 8$ Vertex (6, -8) Opens Down

(d) $y = \frac{3}{4}(x + 13)^2 - 2$ Vertex (-13, -2) Opens up

(e) $y = -(x - 4)^2 + 5$ Vertex (4, 5) Opens Down

Ex. 3. Identify the transformations (in the correct order), the vertex, axis of symmetry, and the direction of opening.

a) $y = (x - 2)^2 - 3$ (2, -3) $y = a(x - h)^2 + k$

horizontal shift right by 2 units
vertical shift down by 3 units

$$y = -2(x + 4)^2 - 7$$

b) $y = 2(x + 4)^2$

Vertical stretch by a factor of 2
 Horizontal shift left by 4 units

multiply

c) $y = -0.5x^2 + 4$

reflection in the x axis
 Vertical compression by a factor of 0.5
 Vertical shift up by 4 units

Assigned Work: $(x - \rightarrow)^2$

1) $y = x^2 - 4$

Vertical shift down by 4 units

2) $y = -3x^2$

reflection in the x axis
 Vertical stretch by a factor of 3

3) $y = 1/2x^2$

Vertical compression by a factor of 1/2

4) $y = (x - 3)^2$

horizontal shift right by 3 units

5) $y = (x + 7)^2$

6) $y = -2(x + 2)^2 + 12$

reflection in the x axis
 Vertical stretch by a factor of 2
 horizontal shift left by 2 units
 Vertical shift up by 12 units.